

Creation of a U.S. Phosphorescent OLED Lighting Panel Manufacturing Facility

Universal Display Corporation

Principal Investigator:

Dr. Michael Hack

mikehack@universaldisplay.com

DE-EE0003253

Other team members:

Moser Baer Technologies

Barry Young (consultant)

Technology focus: OLED Manufacturing

Subtask Priority Area: M.O2. Integrated Manufacturing and Quality Control

Project Objectives

- Establish a U.S. pilot phosphorescent OLED (PHOLED) manufacturing line
- Provide prototype lighting panels to U.S. luminaire manufacturers for incorporation into products to facilitate testing of design concepts and to gauge customer acceptance.
- Provide a cost of ownership analysis to quantify production costs including OLED performance metrics such as yield, materials usage, cycle time, substrate area, and capital depreciation.

Project Team / Capabilities

- Universal Display Corporation (prime)
 - located in Ewing, NJ
 - scale PHOLED technology, transfer and implement this technology to MBT operated pilot line
 - Expertise in OLED technology
 - R&D pilot line to develop OLED lighting panels
- Moser Baer Technologies
 - located in Canandaigua, NY
 - design, build and operate pilot line facility
 - develop mass production technology
 - expertise in high volume, low cost substrate manufacturing
 - Expertise in OLED panel manufacturing
- Barry Young (consultant)
 - provide cost of ownership analysis to quantify costs and performance metrics
 - Expertise in cost modeling and OLED manufacturing facilities

Technical Approach and Work Plan

- UDC and Moser Baer Technologies (MBT) will setup a U.S. based PHOLED pilot lighting manufacturing line.
- UDC's PHOLED technology will be implemented.
- The manufacturing technology for PHOLED lighting products is being implemented in: i) substrate technology; ii) PHOLED technology and; iii) encapsulation technology.
- Proposed innovative manufacturing facility is based on the high throughput processing of 150 mm x 150 mm glass substrates using known and proven production methods.

UDC: PHOLED Panel Milestone Status

Panel Metric	2011 Goal	April 2011	Program Goal	June 2012	June 2012
Area	15 cm x 15 cm	15 cm x 15 cm	15 cm x 15 cm	2 mm ²	15 cm x 15 cm
Efficacy [lm/W]	> 60	58 - 66	> 80	77	70
CRI	> 80	79 - 81	> 80	85	85
Luminance (cd/m ²)	1,000	1,000	>2,000	2,000	1,000
Lifetime (LT70) [hrs]	> 10,000	15,000	20,000	13,000	30,000

Progress - MBT

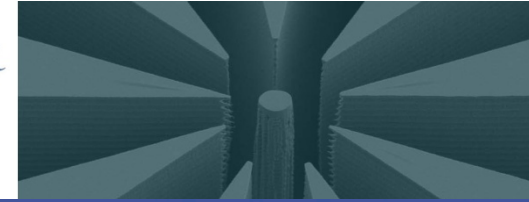
- **Selected site for pilot line: Canandaigua, NY**
- **OLED deposition equipment ordered, built, and accepted at vendor's facility**
 - Complete final site acceptance once equipment installed
- **Construction of cleanroom facility near completion**
 - Complete final fit-up and commission equipment Q3

Site selection: Canandaigua, NY

STC

SMART SYSTEM TECHNOLOGY &
COMMERCIALIZATION CENTER

COLLEGE OF NANOSCALE SCIENCE & ENGINEERING



Welcome to the New STC MEMS
Cutting Edge MEMS Integration

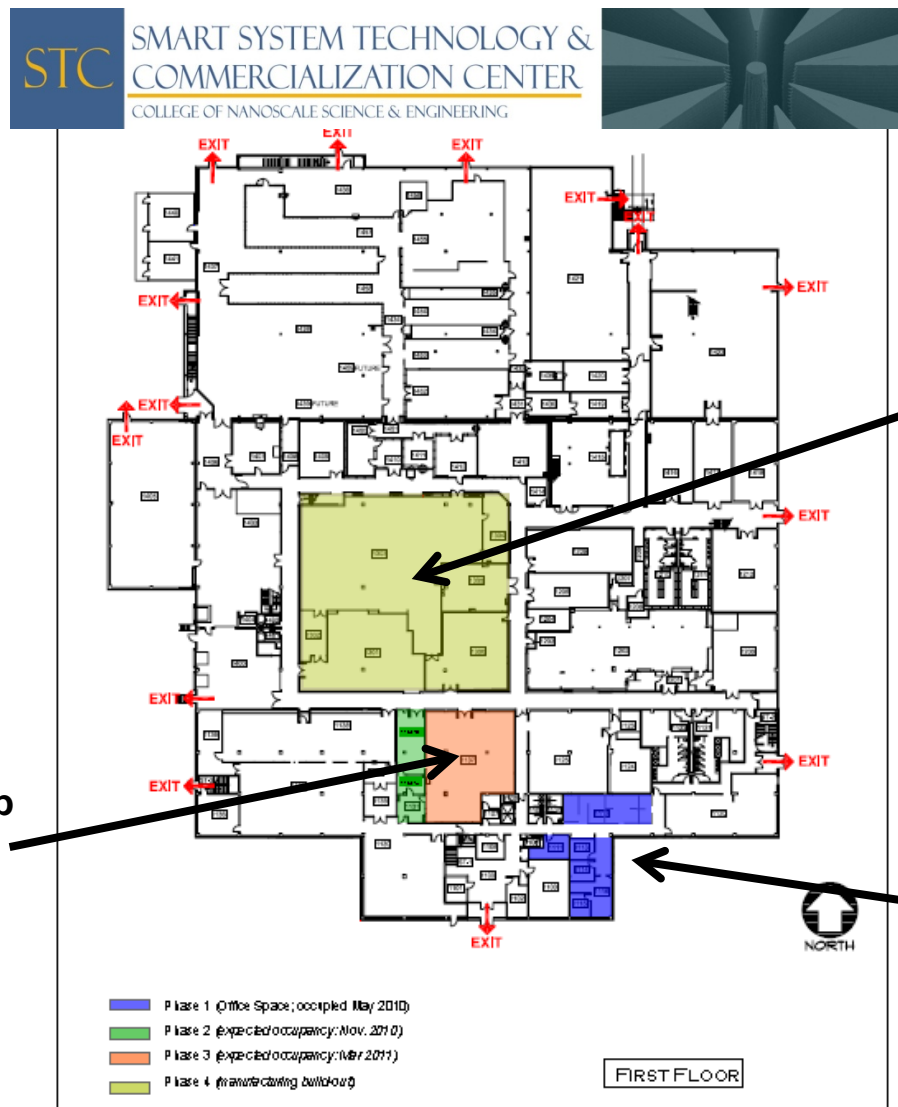
On September 20, 2010, Infotonics Technology Center merged with the Center of Excellence in Nanoelectronics and Nanotechnology at the [College of Nanoscale Science & Engineering \(CNSE\)](#) in Albany to create the Smart System Technology & Commercialization Center (STC).

STC offers the largest array of world-class [MEMS](#)-related solutions in the industry, all under one roof. Located outside Rochester, NY, the 140,000-square-foot, state-of-the-art STC facility includes over 50,000 square feet of certified cleanroom space with 150mm wafer production, complemented by a dedicated 8,000-square-foot MEMS and optoelectronic packaging facility.

moserbaerTM
Technologies

 UNIVERSAL DISPLAY CORPORATION

Facility Layout



MBT Cleanroom



Ready for Commissioning

Plan Forward - MBT

- Complete Phase 3 “Facility Implementation” activities Q3 2012
 - Complete final fit-up and commission production equipment
 - **Implement UDC PHOLED technology and best integrated substrate technology available**
 - First prototype panels

- Continue Phase 4 “Commercial Implementation” activities through Q1 2013
 - Provide prototype lighting panels to luminaire makers
 - Final report of status of pilot facility
 - **Commercial roadmap**

Summary

- PHOLED panel technology on track for program goals
- Key OLED deposition equipment ordered, built, and accepted at vendor's facility
- Site layout, process flows defined
- Cleanroom facility near completion
- Program set to complete January 2013